# PATENT ABSTRACTS OF JAPAN

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## (54) VAPOR-DEPOSITION BIODEGRADABLE FILM MATERIAL AND METHOD FOR MANUFACTURING THE SAME

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a vapor deposition biodegradable film material having regeneration recyclability, generating no environmental pollution, having gas barrier properties and metal gloss and usable in various packaging materials or the like, and a method for manufacturing the same.

SOLUTION: The vapor deposition biodegradable film material is manufactured by forming an anchor layer with a thickness of 0.1-1.0 μm comprising a styrene/maleic acid aqueous resin, a cellulose/urethane resin, a polyester resin, a starchy resin, a cellulose nitrate-containing resin or the like on a polylactic acid or polyester type biodegradable resin film and forming a metal vapor deposition layer with a thickness of 100-1,000 A thereon.

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CLAIMS

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[Claim(s)]
[Claim 1] The vacuum evaporationo biodegradability film material characterized by forming the support layer which becomes the biodegradability resin film of a polylactic acid system or a polyester system from styrene-maleic-acid system aquosity resin, cellulose-urethane resin, polyester resin, starch system resin, nitrocellulose content resin, etc. by the thickness of 0.1-1.0 micrometers, and coming to form the metal vacuum evaporationo layer of 100-1000A thickness on it.
[Claim 2] The vacuum evaporationo biodegradability film material according to claim 1 which the biodegradability resin film of a polylactic acid system or a polyester system is 5-800 micrometers, and is characterized by independent or the thing [ what consists of complex by copolymerization, blend, etc. ] of either a polylactic acid system or a polyester system.
[Claim 3] The manufacture approach of the vacuum evaporationo biodegradability film material characterized by performing coating which becomes the biodegradability resin film of a polylactic acid system or a polyester system from styrene-maleic-acid system aquosity resin, cellulose-urethane resin, polyester resin, starch system resin, nitrocellulose content resin, etc. by the thickness of 0.1-1.0 micrometers as a support layer, and performing metal vacuum evaporationo of 100-1000A thickness on it.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention is a film material which does not produce environmental pollution in a playback recycle nature list, is excellent in gas barrier property, and relates to the vacuum evaporationo biodegradability film material which has metallic luster and can be used for various wrapping etc., and its manufacture approach.
[0002]
[Description of the Prior Art] The problem of the environmental pollution by domestic wastes or industrial waste is in a still severer situation, and is pressed for the immediate action. About especially printed matter, playback recycle is possible, or not producing the environmental pollution in a landfill, incineration disposal, etc. is the indispensable condition which is in charge of use. Moreover, in order that excelling in the practical engine performance (surface ******, abrasion resistance, blocking resistance, lightfastness, etc.) according to various applications may be called for and it may give functionality (antibacterial, water repellence, conductivity, antistatic nature, etc.) further, surface treatment is performed to printed matter in many cases. Also when the lamination using the film as this surface treatment is performed, playback recycle is possible like ****, or not producing environmental pollution at the time of a landfill or incineration disposal is called for. Recycle [ playback recycle was difficult and ] of a landfill at these films although films, such as OPP, PET, and PVC, were used and the large improvement in endurance was obtained as a film for lamination in the former Therefore, the proposal using a biodegradability resin film as a film for lamination is made. That is, if lamination can be performed using a biodegradability resin film, correspondence by compost processing or the landfill will be attained and fault will not occur at the time of disposal of trash. On the other hand, vapor-depositing is well known as a means for giving gas barrier property to a film.
[0003]
[Problem(s) to be Solved by the Invention] However, with the vacuum evaporationo film which vapor-deposited in order to give gas barrier property to said biodegradability resin film, since adhesion reinforcement was about 10g by 15mm width, when it was easy to produce exfoliation on the occasion of lamination etc. and exfoliation arose, it was that by which gas barrier property is also spoiled. Therefore, it was unreliable as a food packaging material, and practical use was not able to be presented. Then, the above-mentioned trouble of this invention, i.e., the adhesion reinforcement of a vacuum evaporationo layer, is high, and it aims at proposing the vacuum evaporationo biodegradability film material with which can maintain high gas barrier property and a food packaging material etc. can be presented.
[0004]
[Means for Solving the Problem] This invention is what was wholeheartedly found out in view of the above after examination. On the biodegradability resin film of a polylactic acid system or a polyester system By the thickness of 0.1-1.0 micrometers, styrene-maleic-acid system aquosity resin, cellulose-urethane resin, It is related with the vacuum evaporationo biodegradability film material characterized

by forming the support layer which consists of polyester resin, starch system resin, nitrocellulose content resin, etc., and coming to form the metal vacuum evaporationo layer of 100-1000A thickness on it, and its manufacture approach.
[0005]
[Function] Without the vacuum evaporationo biodegradability film material of this invention maintaining biodegradability, and being excellent in playback recycle nature, and producing environmental pollution, even if it carries out a landfill, the adhesion reinforcement to the film of a vacuum evaporationo layer is still as higher as 400g or more by 15mm width, oxygen permeability is 2-24 or less hrs-atm of 50 cc/m also about gas barrier property, and steam transmittance is 2-24 or less hrs-atm of 30 g/m. Therefore, even if it faces lamination with paper or other films, the coating processing to a vacuum evaporationo layer front face, etc., exfoliation etc. is not produced and it can use for various kinds of applications. Taking advantage of high gas barrier property, it can use suitable for a food packaging material especially. Moreover, since a vacuum evaporationo layer has metallic luster, it contributes also to design nature.
[0006]
[Embodiment of the Invention] The biodegradability resin film used for this invention is a polylactic acid system or a polyester system, and consists the biodegradability resin of either a polylactic acid system or a polyester system of independent or complex by copolymerization, blend, etc. in detail. The web material of size is sufficient also as the long material to which the 5-800-micrometer thing was selected according to the application etc., and the roll volume of the thickness was carried out suitably.
[0007] As an anchoring agent for forming the support layer in this invention, what does not check biodegradability, and more than a kind specifically chosen from styrene-maleic-acid system aquosity resin, cellulose-urethane resin, polyester resin, starch system resin, nitrocellulose content resin, etc. are used. By forming such a support layer in the thickness of 0.1-1.0 micrometers, the adhesion reinforcement of a metal vacuum evaporationo layer can be raised by leaps and bounds. When the thickness of this support layer is thinner than 0.1 micrometers, the effectiveness of improving the adhesion reinforcement of a metal vacuum evaporationo layer is not acquired, but when thickness is thicker than 1.0 micrometers, it does not see, but the crack of a support layer and blocking are produced, biodegradability is also checked, and the improvement in the adhesion reinforcement beyond it also becomes a cost rise. As a well-known anchoring agent, although the thing of an acrylic resin system or an epoxy resin system is known well, for example, since biodegradability is checked, it cannot be used by these. Therefore, although chosen from the resin which does not check biodegradability as mentioned above, as long as the support layer of this invention is extent which does not check biodegradability and adhesion, a color and a pigment may color and it may blend various additives, such as a slipping agent, a leveling agent, an antiblocking agent, a plasticizer, and a stabilizer.
[0008] By aluminum, silver, an indium, copper, chromium, nickel, titanium, the aluminum oxide, zinc sulfide, silicon oxide, and the 100-1000A thickness that consists of those alloys, the metal vacuum evaporationo layer in this invention performs metal vacuum evaporationo, is obtained, and gives gas barrier property and metallic luster to said biodegradability resin film. When the thickness of this metal vacuum evaporationo layer is thinner than 100A, gas barrier property is inadequate, there is no concealment nature (transparency will come out), and metallic luster is lost, when thicker than 1000A, improvement in the gas barrier property beyond it is not found, but the fall of the flexibility of a film and exfoliation arise, biodegradability is also checked, and it also becomes a cost rise.
[0009] The vacuum evaporationo biodegradability film material of this invention can be suitably manufactured for each of these components using well-known technique. That is, especially the means for forming said support layer and a metal vacuum evaporationo layer is not limited, respectively, adopts well-known technique and can carry out the thing of it. For example, coating can be carried out to formation of a support layer using common coaters, such as a reverse roll coater, gravure coater, a micro gravure coating machine, a comma coating machine, a bar coating machine, an air doctor coating machine, and a knife coating machine.
[0010] In this way, the vacuum evaporationo biodegradability film material of obtained this invention is

printed by offset printing, gravure, flexographic printing, screen-stencil, etc. paper, lamination, and if needed as a film for lamination, and can give and use the coating processing by paint for ultraviolet curing and the electron ray hardening coating as surface treatment further. In that case, it may be made to print so that metallic luster may be efficiently employed in design nature (design). It can be processed without a metal vacuum evaporationo layer exfoliating on the occasion of coating processing, on the occasion of printing, on the occasion of lamination, further, also in this case, since the adhesion reinforcement of a metal vacuum evaporationo layer is high. If what does not check biodegradability as a printing ingredient and a charge of a surface coating material in this case is used, the advantage of not producing environmental pollution in a playback recycle nature list as a product will be maintained. Moreover, the vacuum evaporationo biodegradability film material of this invention can also be used as the biodegradability film chosen from the polylactic acid system and the polyester system, and a food packaging material with high lamination and gas barrier property. The advantage of not producing environmental pollution in a playback recycle nature list as a product in this case is maintained.

[0011]

[Example] [Example 1] After performing viscosity control for "MET-W-164N" by Dainippon Ink & Chemicals, Inc. which is a styrene-maleic-acid system water solution as an anchoring agent using the thickness article of 15 micrometers of "EKOROJU SEP" by Mitsubishi Plastics Industries, Ltd. as a biodegradability resin film of a polylactic acid system, coating was performed by the thickness of 0.5 micrometers using the coating machine for webs, and the support layer was formed. Then, aluminum vacuum evaporationo was performed so that vacuum evaporationo thickness might become 450A at the degree of vacuum of 6.0xten - two Pa, and the substrate temperature (temperature of the vapor-deposited body) of -5 degrees C with the continuation rolling-up type vacuum deposition machine equipped with the evaporation source of a resistance heating method. The aluminum vacuum evaporationo film has metallic luster, and discoloration of the aluminum vacuum evaporationo film by the out gas from the biodegradability resin film which prepared the support layer, and a gloss fall were not observed. The oxygen permeability of the obtained vacuum evaporationo biodegradability film material itself of five cc [/m ] 2 and 24 hrs-atm, and steam transmittance was all as low as 4.5 g/m2 and 24 hrs-atm, and it excelled in gas barrier property, and the (Scotch tape R) adhesion reinforcement of an aluminum vacuum evaporationo layer was as high as 500g/15mm width, and it excelled in lamination fitness with paper or other films. The gloss after a lamination was also good.

[0012] [Example 2] After performing viscosity control for "SF primer" by Dainippon Ink & Chemicals, Inc. which is cellulose-urethane system resin as an anchoring agent using the thickness article of 15 micrometers of "EKOROJU SEP" by Mitsubishi Plastics Industries, Ltd. as a biodegradability resin film of a polylactic acid system, coating was performed by the thickness of 0.4 micrometers using the coating machine for webs, and the support layer was formed. Then, using the vacuum deposition machine equivalent to said example 1, aluminum vacuum evaporationo was performed so that vacuum evaporationo thickness might become 500A. The aluminum vacuum evaporationo film has metallic luster, and discoloration of the aluminum vacuum evaporationo film by the out gas from the biodegradability resin film which prepared the support layer, and a gloss fall were not observed. The oxygen permeability of the obtained vacuum evaporationo biodegradability film material itself of 4.5cc [/m ] 2 and 24 hrs-atm, and steam transmittance was all as low as 4 g/m2 and 24 hrs-atm, and it excelled in gas barrier property, and the (Scotch tape R) adhesion reinforcement of an aluminum vacuum evaporationo layer was as high as 700g/15mm width, and it excelled in lamination fitness with paper or other films. The gloss after a lamination was also good.

[0013] [Example 3] After performing viscosity control for "Randy EA100" by Miyoshi Oil & Fat Co., Ltd. who is starch system resin as an anchoring agent using the thickness article of 15 micrometers of "EKOROJU SEP" by Mitsubishi Plastics Industries, Ltd. as a biodegradability resin film of a polylactic acid system, coating was performed by the thickness of 0.6 micrometers using the coating machine for webs, and the support layer was formed. Then, using the same vacuum deposition machine as said example 1, aluminum vacuum evaporationo was performed so that vacuum evaporationo thickness might become 450A. The aluminum vacuum evaporationo film has metallic luster, and discoloration and

a gloss fall were not observed. The oxygen permeability of the obtained vacuum evaporationo biodegradability film material itself of five cc[/m ] 2 and 24 hrs-atm, and steam transmittance was all as low as 4 g/m2 and 24 hrs-atm, and it excelled in gas barrier property, and the (Scotch tape R) adhesion reinforcement of an aluminum vacuum evaporationo layer was as high as 500g/15mm width, and it excelled in lamination fitness with paper or other films. The gloss after a lamination was also good.
[0014] [Example 4] After performing viscosity control for "MET-W-164N" by Dainippon Ink & Chemicals, Inc. which is a styrene-maleic-acid system water solution as an anchoring agent using the thickness article of 20 micrometers by the office media company as a biodegradability resin film of a polylactic acid system, coating was performed by the thickness of 0.5 micrometers using the coating machine for webs, and the support layer was formed. Then, using the same vacuum deposition machine as said example 1, aluminum vacuum evaporationo was performed so that vacuum evaporationo thickness might become 450A. The oxygen permeability of the obtained vacuum evaporationo biodegradability film material itself of four cc[/m ] 2 and 24 hrs-atm, and steam transmittance was all as low as 4.5 g/m2 and 24 hrs-atm, and it excelled in gas barrier property, and the (Scotch tape R) adhesion reinforcement of an aluminum vacuum evaporationo layer was as high as 600g/15mm width, and it excelled in lamination fitness with paper or other films. The gloss after a lamination was also good.
[0015] [Example 5] It completely manufactured on these conditions with said example 1 except making thickness of an aluminum vacuum evaporationo layer into 200A. Discoloration of the aluminum vacuum evaporationo film according [ the obtained vacuum evaporationo biodegradability film material ] to the out gas from a biodegradability resin film and a gloss fall were not observed. Moreover, the oxygen permeability of itself of 30cc[/m ] 2 and 24 hrs-atm, and steam transmittance was all as low as 20g[/m ] 2 and 24 hrs-atm, and it excelled in gas barrier property, and the (Scotch tape R) adhesion reinforcement of an aluminum vacuum evaporationo layer was as high as 500g/15mm width, and it excelled in lamination fitness with paper or other films. The gloss after a lamination was also good.
[0016] [Example 6] It completely manufactured on these conditions with said example 1 except making thickness of an aluminum vacuum evaporationo layer into 700A. Discoloration of the aluminum vacuum evaporationo film according [ the obtained vacuum evaporationo biodegradability film material ] to the out gas from a biodegradability resin film and a gloss fall were not observed. Moreover, the oxygen permeability of itself of four cc[/m ] 2 and 24 hrs-atm, and steam transmittance was all as low as 3g[/m ] 2 and 24 hrs-atm, and it excelled in gas barrier property, and the (Scotch tape R) adhesion reinforcement of an aluminum vacuum evaporationo layer was as high as 450g/15mm width, and it excelled in lamination fitness with paper or other films. The gloss after a lamination was also good.
[0017] [Example 1 of a comparison] Aluminum vacuum evaporationo was performed using the same vacuum deposition machine as said example 1 so that vacuum evaporationo thickness might become 450A, without using an anchoring agent using thickness the article of 15 micrometers of "EKOROJU SEP" by Mitsubishi Plastics Industries, Ltd. as a biodegradability resin film of a polylactic acid system. The appearance of the obtained vacuum evaporationo film was good, the oxygen permeability of the vacuum evaporationo film itself of 3 cc/m2 and 24 hrs-atm, and steam transmittance was all as low as 4 g/m2 and 24 hrs-atm, although gas barrier property was excellent, the (Scotch tape R) adhesion reinforcement of an aluminum vacuum evaporationo layer was as low as 10g/15mm width, exfoliation took place from the vacuum evaporationo layer after lamination with paper or other films, and practical use was not able to be presented.
[0018] Although this invention was explained based on the example above, this invention is not limited to said example, and unless the configuration of a publication is changed into a claim, it can be carried out even to how.
[0019]
[Effect of the Invention] Environmental pollution is not produced, even if it excels and carries out a landfill to playback recycle nature since the ingredient which checks biodegradability is not used for the vacuum evaporationo biodegradability film material and its manufacture approach of this invention as explained above. Moreover, since the adhesion reinforcement to the film of a metal vacuum evaporationo layer is high, even if a vacuum evaporationo layer faces paper, the coating processing to a

lamination metallurgy group vacuum evaporationo layer front face with other films, etc., exfoliation etc. is not produced and high gas barrier property can be maintained continuously. Therefore, taking advantage of various kinds of applications and especially high gas barrier property, it can use suitable for a food packaging material, and since a metal vacuum evaporationo layer has metallic luster, it contributes also to design nature.

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SOLUTION: The vapor deposition biodegradable film material is manufactured by forming an anchor layer with a thickness of 0.1-1.0 μm comprising a styrene/maleic acid aqueous resin, a cellulose/urethane resin, a polyester resin, a starchy resin, a cellulose nitrate-containing resin or the like on a polylactic acid or polyester type biodegradable resin film and forming a metal vapor deposition layer with a thickness of 100-1,000 A thereon.

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